STA 580 — Fall 2007 — Dr. Charnigo

Practice Final Examination

Please print your name at the tops of all seven pages. You may use the backs of the pages for scratch work, but all key steps and final answers are to be clearly recorded on the fronts of the pages. *For the actual final examination — Thursday 13 December, 3:30 to 5:30 p.m.,* **NURS 201** *— you must bring your textbook or, at least, photocopies of the exercise sets from Chapters 11, 12, and 13 plus Tables 3, 5, 6, and 9. You must also bring a calculator — check the batteries.*

[25] 1. Refer to "Hypertension" and Table 11.25 on page 551. Let X denote the log dose of bosentan to which a group of patients has been randomized (with the convention that $X = 0$ for the group of patients randomized to placebo), and let Y denote the mean change in systolic blood pressure for a group of patients. Thus, for example, $x_1 = 0$, $x_2 = 4.61$, $y_1 = -0.9$, and $y_2 = -2.5$. We have $L_{yy} = 64.42$, $L_{xx} = 37.00$, $L_{xy} = -43.66$, $\bar{y} = -5.9$, $\bar{x} = 5.07$, and $n = 5$. In what follows, we consider the linear regression model $Y_i = \alpha + \beta x_i + \epsilon_i$.

[05] a. Provide the least squares estimates of α and β.

[05] b. Test $H_0 : \beta = 0$ against $H_1 : \beta \neq 0$ at level 0.05 using an f statistic.

[05] c. Test $H_0 : \beta = -1$ against $H_1 : \beta \neq -1$ at level 0.05 using a t statistic.

[05] d. Provide a 95% prediction interval for the mean change in systolic blood pressure for a new group of patients receiving 100 mg of bosentan, noting that $\log(100) = 4.61$.

[05] e. Compute and interpret R^2.

[25] 2. Refer to "Mental Health" and Table 12.27 on page 620. Let μ_1 through μ_4 be defined in the obvious manner. We have Within SS = 4.3084 and Total SS = 8.3317. Also, $t_{49,0.975} = 2.01$, $t_{49,0.9875} = 2.31$, $t_{49,0.9917} = 2.48$, $f_{4,49,0.95} = 2.56$, and $f_{3,49,0.95} = 2.79$.

[05] a. Find Between SS.

[05] b. Find Between MS and Within MS.

[05] c. Test $H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$ against the complementary alternative at level 0.05.

[05] d. Test $H_0 : \mu_1 = \mu_2$, $H_0 : \mu_1 = \mu_3$, and $H_0 : \mu_1 = \mu_4$ against their respective complementary alternatives at Bonferroni-adjusted level 0.05.

[05] e. Judging from Table 12.27, what assumption underlying the test in part c may not be realistic?

[25] 3. Refer to "Endocrinology" and Table 13.36 on page 734. Confine your attention to the data for women aged 55 to 80. Let p_1 denote the five-year rate of fractures in the population of 55-to-80 women drinking "control" water and p_2 the rate in the population of 55-to-80 women drinking "higher calcium" water.

[05] a. Report point estimates of p_1 and p_2.

[05] b. Construct a 95% confidence interval for the risk difference.

[05] c. Construct a 95% confidence interval for the relative risk.

[05] d. Construct a 95% confidence interval for the odds ratio.

[05] e. Test $H_0 : p_1 = p_2$ against $H_1 : p_1 \neq p_2$ at level 0.05 using either a z statistic or a χ^2 statistic (your choice).

[25] 4. Mark each of the following statements as true or false.

T F [05] a. If we have an ordinal response variable and wish to compare the median from one population to the median from another population, we may draw independent samples from the two populations and then employ the signed rank test.

T F [05] b. If we have an ordinal response variable and wish to compare the mean from one population to the mean from another population, we may draw independent samples from the two populations and then employ the rank sum test.

T F [05] c. If the Kaplan-Meier estimate of a survival function is 0.60 at 2 years, then we estimate that 40% of people in the population of which the sample is representative would experience the event of interest within 2 years.

T F [05] d. The log rank test is guaranteed to reject the null hypothesis of equal survival functions for two populations whenever the corresponding Kaplan-Meier estimates differ.

T F [05] e. The Scheffe procedure may be used to perform follow-up tests concerning pairs of population medians after the Kruskal-Wallis test rejects the omnibus null hypothesis of equal medians for all populations of interest.